

**What is Claimed is:**

1. An electronic payment and accountancy system comprising:  
a handheld electronic data carrier defining a travel pass having a

5 monetary buying power;

a transaction terminal for the purchase of goods or services, said terminal comprising means to securely increment as well as to decrement the monetary buying power of said travel pass;

means for transferring data between the terminal and the travel pass;

10 means for storing in said terminal a price value P for an intended purchase of goods or services;

means for storing in said travel pass a monetary buying power VO;

means for storing a fixed, predetermined buying power VPRE;

15 means for temporarily holding in said terminal identifying data of travel passes that were incremented by said terminal during a given service period;

means for comparing an intended purchase price value P with the stored monetary buying power VO of said travel pass;

means for incrementing said monetary buying power VO by an amount corresponding to said predetermined buying power VPRE when said price value P is greater than said monetary buying power VO; and

20 means for decrementing said monetary buying power VO by an amount corresponding to said price value P.

2. A system according to claim 1 further comprising:

25 means for receiving and storing in said terminal identifying data relating to invalid travel passes;

means for comparing the identifying data of said travel pass with said identifying data relating to invalid travel passes; and wherein

30 said purchase is prevented when the identifying data of the travel pass corresponds to identifying data of an invalid travel pass.

3. A system according to claim 1 further comprising a plurality of travel passes and comprising means for transmitting the stored data identifying travel passes that were incremented to a computer of a financial institution.

4. A system of claim 1 comprising a first group of transaction terminals for the purchase of goods and services and a second group of terminals connected to a public telecommunications network, said second group of terminals being reserved for updating travel passes, and further comprising:

means for storing in the travel pass a personal identifying number (PIN);

means for storing in the travel pass a telephone number;

means for encrypting said stored telephone number before sending the number into the public network;

a secure branch exchange station for receiving said encrypted telephone number, decrypting said number and sending said decrypted number to further telephone exchange stations; and

a bank computer comprising means for receiving and verifying the PIN of a travel pass to check the status of an associated bank account, and to return a validation signal when the travel pass is valid, wherein

a signal is sent from the bank computer to increment the buying power of said travel pass by the predetermined buying power to provide an updated monetary buying power.

5. A system according to claim 4 wherein the bank computer also transmits the date and time of the update transaction to the travel pass, and wherein any subsequent request for an update from an update terminal will require from the travel pass a transmission of the date and time of the last update and comparison of the data with the date and time stored in the bank computer, and wherein the update is refused if the input date and times do not match those stored in the bank computer.

6. A system according to claim 1 further comprising means for storing in said travel pass at least two pre-selected personal identifying numbers (PIN-1 and PIN-2), said PIN-1 being selected and entered by the owner of the travel pass after having entered the correct PIN-2, in order to make the travel pass available to other users; and wherein PIN-2 can be used for pass value update operation, whereas PIN-1 cannot be used for pass value update

operation; and wherein PIN-2 can be changed after entering the correct PIN-2, whereas PIN-1 does not allow either of the PIN numbers to be changed.

7. A system as claimed in claim 4, further comprising:

means for entering a PIN enable function;  
time laps circuitry adapted to be preset by the user to produce delays using keys on the travel pass; and

means for automatically switching off the PIN enable function after lapse of the preset time, thereby rendering the travel pass unusable.

8. A system as claimed in claim 1, further comprising a keyboard for manually entering data or commands;

display means for displaying said data or commands on said travel pass;

means for characterizing different types of transaction events capable of being carried out using the travel pass; and

wherein, upon input of a command via the keyboard, past transaction events are displayed on the travel pass together with characterizing codes according to the stored characterization for said events.

9. A system as claimed in claim 8, wherein, upon receipt of a command followed by a selected category code, said travel pass displays all passed transaction events of the types characterized by the input code, together with respective dates and times of said transactions.

10. A system as claimed in claim 9, wherein, upon input of a third command accompanied by an identifying code of a particular merchant, the travel pass will display the aggregate monetary amounts and dates of purchases made from said merchant, together with any discount offered by said merchant which may be available for further purchases.

11. A system as claimed in claim 10, wherein, upon receipt of a fourth command followed by one or more categories codes, the travel pass will display the percentage ratio of expenses incurred during a current

accountancy period (defined between two updates) for items associated with the keyed-in category codes versus the rest of all expenses during the same period.

5 12. A system as claimed in claim 8, wherein any data displayed, or all the event data stored in the said travel pass are emptied from the memory of the travel pass upon transference by contactless means to a computer base for longer-term storage and further processing.

10 13. A system as in claim 12, further comprising computer means comprising an accounting sector to store summary and other data held in memory in said travel pass, and

contactless interface means in the said computer to receive data from said travel pass, wherein a command word entered on, or transmitted to, said  
15 travel pass, causes all event retaining memory of the travel pass to be emptied and unloaded into the accounting sector of the said computer means, thereby clearing a memory space in the travel pass while preserving the essential summary data.

20 14. A system as in claim 1, further comprising:

means for storing a merchant's identifying number and/or account details;

means to register an agreed part payment schedule to pay off the purchase of an item by the holder of the travel pass offered for sale by said  
25 merchant; and

storage means to memorize a sales price and a fixed division of said price for defining part payment instruction to a bank of the holder.

30 15. A system as claimed in claim 1, further comprising means for generating field disturbances by the said terminal communicating with said travel pass via at least one coil or at least one antenna loop when respective fields of the terminal means and travel pass overlap so that both data and operating energy can be transferred.

16. The system of claim 15, wherein the terminal has one of either two coils or two antenna loops serially connected in such a manner that their respective electromagnetic fields are in anti-phase to each other thereby tending to generate a more concentrated configuration of its electromagnetic energy in order to transfer a larger portion of it to the travel pass, and to render the transfer system largely immune to external interference signals, and virtually free of harmful radiation.

17. A system as in claim 1, for use in a depot computer for processing data for a bus comprising:

an on-bus control system comprising means to store the travel pass serial numbers as and when such passes are updated by said general predetermined increment VPRE; and

sorting means in the depot computer to prepare batch transmissions to various financial institutes of updated travel passes identifying data in order to debit the corresponding accounts and to refund a transit authority for having updated such passes.

18. An electronic payment and accountancy system as claimed in claim 1, for use in fare collection on long-distance bus lines, comprising:

a first transaction terminal mounted on board of the bus close to the driver's seat to check passengers' passes and to enter into them respective codes for their boarding points;

processing means in the said first transaction terminal to determine the fare from the said board point to a next major bus station;

transaction means to debit the travel pass presented for validation with said fare;

a second transaction terminal mounted externally to the bus;

processing means in said second transaction terminals to relate entrance and exit points to a fare table and to compare it with the fare that the passenger has paid at the boarding point; and

means in the second transaction terminal for refunding the travel pass for the untraveled portion of the journey.

19. An electronic payment and accountancy system as in claim 1, comprising:

clock pulse emulator means for reconstructing from a stream of received data precise strobing pulses to produce a requisite transfer of data into a serial register in said travel pass or respectively in said terminal.

20. An electronic payment and accountancy system as claimed in claim 1, comprising:

a first of travel pass comprising a cardlike device having standard credit card dimensions and containing reactive transfer elements and processing circuits; and

a second travel pass comprising manual data entry and visual feedback means,

wherein each said travel pass can interchangeably be used on said terminal.

21. An electronic payment and accountancy system as claimed in claim 1, said travel pass comprising:

a standard ISO dimensioned card containing reactive sensors for field disturbances as a means for receiving and sending data and an influx of electromagnetic power;

microprocessor means for receiving and memorizing said data;

a low-power consumption display means for displaying data outputted by said microprocessor;

means for converting AC energy into DC voltage; and

a capacitor for storing DC energy, wherein the said storage energy is applied to display means.

22. An electronic payment and accountancy system as claimed in claim 1, comprising:

a first group of transaction terminals at points of sale for purchase of goods or services through an exchange of digital data;

a second group of transaction terminals designed to cooperate with transaction terminals of distant accountancy systems, with each of these

terminals having means for connecting to a communication line or network in order to establish an exchange of data between said travel pass and one of said distant accountancy systems, so as to make payment at a given distant point of sale, or to receive an update into said travel pass specifying information concerning service entitlements after having rendered remote payment thereof, or to receive into that said travel pass data defining specific service entitlements after having rendered remote payment from said travel pass.

23. An electronic payment and accountancy system as claimed in claim 22, characterized by:

the combination and integration of the said transaction terminals with a piece of equipment connectable to the existing telephone cable network and switching system.

24. An electronic payment and accountancy system as claimed in claim 22, further comprising:

a telephone set in combination with said transaction terminals, for assisting the preparation stage of an intended transaction, or of an intended conversion of a travel pass into an entitlement-ticket through a distant accountancy system.

25. An electronic payment and accountancy system as claimed in claim 24, further comprising:

a travel pass read/write terminal accommodated within the said telephone set in such a manner that a travel pass upon being placed close to the outer surface of the said telephone set, in a predetermined area thereof, will exchange data by inductive transfer.

26. An electronic payment and accountancy system as in claim 1, wherein the travel pass automatically produces the summation of certain data.

27. An electronic payment and accountancy system as claimed in claim 1, wherein the said travel pass is manifested in one of three basic varieties,

characterized by functionally uniform terminals at a point of transaction station,

and wherein those different basic varieties are selected from the group comprising:

5 (A) a card containing an IC chip connected to at least one antenna wire,

(B) a card as containing an IC chip connect to at least one antenna wire plus an extra storage capacitor in miniature form, plus a visual display unit,

10 (C) a handheld device with a built-in chip and at least one antenna wire, and additionally furnished with a keyboard.

28. An electronic payment and accountancy system as claimed in claim 1, the said travel pass having at least one electromagnetic antenna element for signal transfer to a reader device which has at least one electromagnetic antenna element for radiating from said travel pass data identifying it and its owner, and further means in the system for forwarding said identifying data together with transaction data to a data processing station of an issuer of said travel pass.

29. An electronic payment and accountancy system as claimed in claim 1, the said travel pass having at least one electromagnetic coil or wire loop for signal transfer to a reader device which has at least two coils or wire loops, said reader also having facilities for processing and storing said signals which partly represent identifying data for the travel pass and transaction defining data, and

means for transmitting to an issuer of said financial account the said transaction data together with said account defining data.

30. An electronic payment and accountancy system as in claim 1, further comprising:

means residing in an accountancy system of a service provider to increase the value of the said travel pass after a transaction that reduces its value below the minimum threshold, by a pre-determined amount VPRE;



interrogation means to check that said travel pass holds identifying information which holds a valid account of the owner of said travel pass; and  
means for transmitting the account identifying data to an issuer of said travel pass.

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31. An electronic payment and accountancy system as in claim 30, further comprising a service provider containing a daily refreshed list of invalid identifying information with which the identifying information derived from the travel pass is compared before the said update of the monetary value of the travel pass is executed by the said service provider accountancy system.

32. An electronic payment and accountancy system as claimed in claim 1 and a therewith associated telecommunication system, wherein said travel pass has an associated user wherein said travel pass is relieved from executing any computational or processing tasks, by delegating these tasks to a computer of an accountancy centre, and wherein assurance for the user of said travel pass as to the correctness of the results to be debited to the user is obtained by a procedure which comprises:

(A) calculation of a first transaction result in the terminal or the said accountancy centre;

(B) transmission of the first result to the travel pass;

(C) readout of the first result from said travel pass;

(D) calculation of a second transaction result by the terminal or the accountancy centre; or

(E) comparing the second result with the figure returned from the travel pass as user readout (C) or as memorized within the said accountancy centre; and

(F) if the compared figures are equal, a comparator output is generated and a signal symbolizing "tested" is visibly displayed, thereby permitting the processor of the said travel pass to enter the result into its memory register.

33. A system as claimed in claim 1, wherein said travel pass comprises:  
a protective shell for retaining a conventional smart card;

contractors mounted in the interior thereof;  
an antenna built into the walls of the shell or protruding therefrom;  
circuitry for loading the electromagnetic field whenever one of a high  
level logic bit or a low level logic bit is to be transferred from the card to the  
5 transaction terminal;

wherein said protective shell has an opening for receiving the said  
smart card, and for presenting said entity to a transaction terminal.

34. A system as in claim 33, wherein said shell is equipped with a data  
10 entry facility and a display window.

35. A system as in claim 34, wherein said antenna has a resonance  
frequency, said frequency being compatible with data transmission over long  
distances by means of short- and ultra-short radio waves.